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(71)Applicant : SAMSUNG ELECTRO MECH CO LTD
(72)Inventor : SUNG JAE SUK

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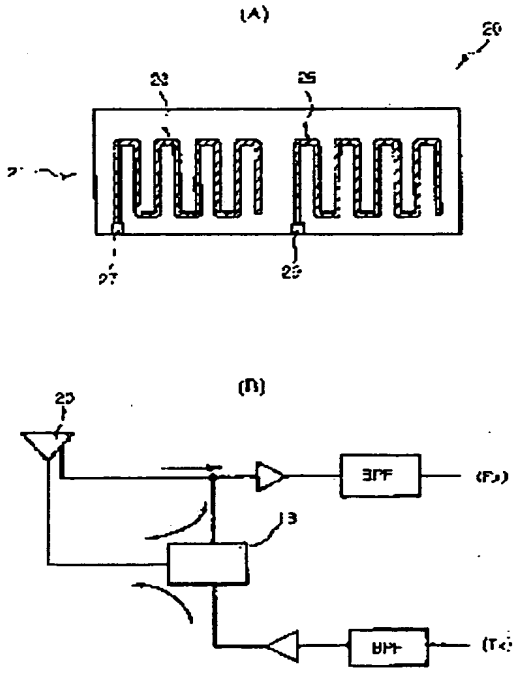
(54) DUAL FEEDING CHIP ANTENNA WITH DIVERSITY FUNCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a chip antenna equipped with not only a transmitting/ receiving function but also a diversity function.
SOLUTION: This antenna is provided with a dielectric substrate 21, an antenna 20 for transmitting/receiving formed from a first conductor pattern 23 in a portion of area on the dielectric substrate 21, an antenna 20 for diversity formed from a second conductor pattern 25 in another portion of the area on the dielectric substrate 21, a first feeding terminal 27 formed on one end of the antenna 20 for transmitting/receiving to be linked to a transmitting terminal circuit part and a receiving terminal circuit part, and a second feeding terminal 29 formed on one end of the antenna 20 for diversity to be linked to the receiving terminal circuit part.



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CLAIMS

[Claim(s)]
[Claim 1] The dual feed chip antenna equipped with the diversity function characterized by providing the following Dielectric substrate 21 It is the antenna 20 for transmission and reception formed in the field by the 1st conductor pattern 23 on the aforementioned dielectric substrate 21 a part. The others on the aforementioned dielectric substrate 21 are the antennas 20 for diversities formed in the field by the 2nd conductor pattern 25 a part. The 2nd electric supply terminal 29 for being formed in the end of the aforementioned antenna 20 for transmission and reception, being formed in the 1st electric supply terminal 27 for connecting with the transmitting-end circuit section and the receiving-end circuit section, and the end of the aforementioned antenna 20 for diversities, and connecting with the aforementioned receiving-end circuit section
[Claim 2] At least one of the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 is the dual feed chip antenna equipped with the diversity function according to claim 1 characterized by being the pattern which repeats a predetermined angle change twice [at least] or more.
[Claim 3] The dual feed chip antenna equipped with the diversity function according to claim 1 characterized by for the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above having kept the predetermined interval, and separating and forming them.
[Claim 4] The 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above are the dual feed chip antenna equipped with the diversity function according to claim 1 characterized by having the polarization which changes with directions formed, respectively.
[Claim 5] The 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above are the dual feed chip antenna equipped with the diversity function according to claim 1 characterized by having mutually different length.
[Claim 6] At least one of the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above is the dual feed chip antenna equipped with the diversity function according to claim 1 characterized by being formed in a meander line (meander line) type.
[Claim 7] The dual feed chip antenna equipped with the diversity function characterized by providing the following Dielectric substrate 21 It is the antenna 20 for transmission and reception formed in the field by the 1st conductor pattern 33 and 43 in the aforementioned dielectric substrate 21 a part. The others in the aforementioned dielectric substrate 21 are the antennas 20 for diversities formed in the field by the 2nd conductor pattern 35 and 45 a part. The 2nd electric supply terminal 29 for being formed in the end of the aforementioned antenna 20 for transmission and reception, being formed in the 1st electric supply terminal 27 for connecting with the transmitting-end circuit section and the receiving-end circuit section, and the end of the aforementioned antenna 20 for diversities, and connecting with the aforementioned receiving-end circuit section
[Claim 8] The aforementioned antenna 20 for transmission and reception and the aforementioned antenna 20 for diversities are a dual feed chip antenna equipped with the diversity function according to claim 7 characterized by being arranged at the coplanar inside [dielectric substrate 21] the above.

[Claim 9] At least one of the 1st conductor pattern 33 and 43 of the above and the 2nd conductor pattern 35 and 45 is the dual feed chip antenna equipped with the diversity function according to claim 7 characterized by being the pattern which repeats a predetermined angle change twice [at least] or more.
[Claim 10] The dual feed chip antenna equipped with the diversity function according to claim 7 characterized by for the 1st conductor pattern 33 and 43 of the above and the 2nd conductor pattern 35 and 45 of the above having kept the predetermined interval, and separating and forming them.
[Claim 11] The 1st conductor pattern 33 and 43 of the above and the 2nd conductor pattern 35 and 45 of the above are the dual feed chip antenna equipped with the diversity function according to claim 7 characterized by having the polarization which changes with directions formed, respectively.
[Claim 12] The 1st conductor pattern 33 and 43 of the above and the 2nd conductor pattern 35 and 45 of the above are the dual feed chip antenna equipped with the diversity function according to claim 7 characterized by having mutually different length.
[Claim 13] At least one of the 1st conductor pattern 33 and 43 of the above and the 2nd conductor pattern 35 and 45 of the above is the dual feed chip antenna equipped with the diversity function according to claim 7 characterized by being formed in a meander line type.
[Claim 14] The laminating chip antenna equipped with at least two dielectric substrates characterized by providing the following the above — the antenna 50 for transmission and reception formed by the conductor pattern 53 on one dielectric substrate between two dielectric substrates 51 and 52 even if few the above — the antenna 50 for diversities formed by the conductor pattern 55 on one more dielectric substrate between two dielectric substrates 51 and 52 even if few The 1st electric supply terminal 57 for being formed in the end of the aforementioned antenna 50 for transmission and reception, and connecting with the transmitting-end circuit section and the receiving-end circuit section The 2nd electric supply terminal 59 for being formed in the end of the aforementioned antenna 50 for diversities, and connecting with the aforementioned receiving-end circuit section

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the dual feed chip antenna which can carry out simultaneously more the usual transceiver function and the diversity function which raises receiving sensitivity to a detail about the dual feed chip antenna (dual feeding chip antenna) equipped with the diversity (diversity) function.
[0002]
[Description of the Prior Art] Generally, as for a mobile communications machine, electric wave environment changes with movement of a user. That is, multiple rays are generated by the move position and phasing (fading) of a signal may occur. In order to make phasing of such a signal mitigate, two or more antennas are used. Under the present circumstances, the antenna added is called antenna for diversities. The antenna of a mobile communications machine consists of a common antenna for transmission and reception, and an antenna for diversities.
[0003] Drawing 4 (A) is the schematic diagram of the end machine 110 of the non-end of line which has the antenna structure mentioned above. Reference of drawing 4 (A) is equipped with the whip antenna 115 by which the aforementioned radio terminal 110 was connected with ** / receiver 112 through the matching circuit section 114, and the monotonous antenna 116 connected with another receiver 113. The aforementioned whip antenna 115 plays the role of the common antenna for transmission and reception, and the aforementioned monotonous antenna 116 plays the role for raising receiving sensitivity. The aforementioned whip antenna 115 and the aforementioned monotonous antenna 116 have accomplished reverse F type.
[0004] Such structure has circuitry shown in drawing 4 (B). Drawing 4 (B) is the circuit diagram of the transmitter-receiver equipped with this kind of diversity function. The transmitter-receiver equipped with the aforementioned diversity function is equipped with the 1st antenna 115 for transmission and reception, and the 2nd antenna 116 for a diversity function as shown in drawing 4 (B). The 1st antenna 115 of the above is equipped with a duplexer 118, and the aforementioned duplexer 118 commits it as a filter for a sending signal and an input signal. Moreover, the 2nd antenna 116 of the above is connected with a receiving end (Rx), phasing is removed, and the diversity reception function for improving receiving sensitivity is performed.
[0005]
[Problem(s) to be Solved by the Invention] By the way, the radio terminal for realizing the conventional diversity function must be equipped with another antenna besides the common antenna for transmission and reception so that drawing 4 (A) and drawing 4 (B) may show. A manufacturing cost not only increases, but by adding such an antenna, it must take the space for two antennas into consideration also at the time of the design of the internal circuitry of communication equipment, and the problem that the appearance of a transmitter becomes large by installation of an additional antenna arises. And the diversity antenna had a difficulty on internal design that the attaching position of the two aforementioned antennas must be taken into consideration minute, in order to acquire a desired property, since the common antenna for transmission and reception shows a different property by the attaching position.
[0006] this invention is for solving this problem. the purpose Both the 1st conductor pattern for

a transceiver antenna and the 2nd conductor pattern for a diversity antenna are formed on a single dielectric substrate using the manufacturing technology of a chip antenna. The 2nd electric supply terminal connected with the 1st electric supply terminal connected with a transmitter and a receiver and a receiver is prepared in the end of the 1st conductor pattern of the above, and each 2nd conductor pattern, and it is in offering the chip antenna equipped not only with both a transceiver function but the diversity function.

[0007] Including the 1st dielectric substrate in which the 1st conductor pattern was formed, and the 2nd dielectric substrate in which the 2nd conductor pattern was formed, other purposes of this invention form the 1st electric supply terminal and the 2nd electric supply terminal in the end of each conductor pattern, and are to offer the multilayer type chip antenna equipped not only with both a transceiver function but the diversity function.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is set at a chip antenna. The dielectric substrate 21, On the aforementioned dielectric substrate 21, a part The antenna 20 for transmission and reception formed in the field by the 1st conductor pattern 23, The others on the aforementioned dielectric substrate 21 a part The antenna 20 for diversities formed in the field by the 2nd conductor pattern 25, It is formed in the end of the aforementioned antenna 20 for transmission and reception, and comes to contain the 1st electric supply terminal 27 for connecting with the transmitting-end circuit section and the receiving-end circuit section, and the 2nd electric supply terminal 29 for being formed in the end of the aforementioned antenna for diversities, and connecting with the aforementioned receiving-end circuit section. Therefore, it has both not only a transceiver function but a diversity function. the gestalt of suitable operation of this invention -- the [the 1st conductor pattern 23 of the above, or] -- the 2 conductor pattern 25 can form a predetermined angle change in the form of the pattern repeated twice [at least] or more Furthermore, with the gestalt of other operations of this invention, a predetermined interval can be kept and separation formation of the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above can be carried out mutually. Further, with the gestalt of other operations, it can also manufacture so that it may have the polarization from which the direction of this invention formed, respectively differs mutually the 1st conductor pattern 23 of the above, and the 2nd conductor pattern 25 of the above. Moreover, a new diversity property is also expectable by changing the length of the 1st conductor pattern 23 of the above with the length of the 2nd conductor pattern 25 of the above. At least one of the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above makes it a summary to be formed in a meander line (meander line) type. Therefore, the problem on the conventional internal design is solvable.

[0009] In order to attain the above-mentioned purpose, this invention further moreover, with the gestalt of other operations In the dielectric substrate 21 and the aforementioned dielectric substrate 21, a part The antenna 20 for transmission and reception formed in the field by the 1st conductor pattern 33 and 43, The others in the aforementioned dielectric substrate 21 a part The antenna 20 for diversities formed in the field by the 2nd conductor pattern 35 and 45, It is formed in the end of the aforementioned antenna 20 for transmission and reception, and consists of the 1st electric supply terminal 27 for connecting with the transmitting-end circuit section and the receiving-end circuit section, and the 2nd electric supply terminal 29 for being formed in the end of the aforementioned antenna 20 for diversities, and connecting with the aforementioned receiving-end circuit section. Therefore, it has both not only a transceiver function but a diversity function. The aforementioned antenna for transmission and reception and the antenna for diversities can be made into various conductor patterns like the 1st conductor pattern 33 constituted, respectively and the gestalt of operation which could constitute the 2nd conductor pattern 35 and 45 by reaching 43 so that it might be located on the same flat surface, and was mentioned above. the [namely, / the 1st conductor pattern 23 of the above, or] -- the 2 conductor pattern 25 can form a predetermined angle change in the form of the pattern repeated twice [at least] or more Furthermore, with the gestalt of other operations of this invention, a predetermined interval can be kept and separation formation of the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above can be carried out

mutually. Further, with the gestalt of other operations, it can also manufacture so that it may have the polarization from which the direction of this invention formed, respectively differs mutually the 1st conductor pattern 23 of the above, and the 2nd conductor pattern 25 of the above. Moreover, a new diversity property is also expectable by changing the length of the 1st conductor pattern 23 of the above with the length of the 2nd conductor pattern 25 of the above. At least one of the 1st conductor pattern 23 of the above and the 2nd conductor pattern 25 of the above makes it a summary to be formed in a meander line (meander line) type. Therefore, the problem on the conventional internal design is solvable.

[0010] In order to attain the above-mentioned purpose, furthermore, this invention In the laminating chip antenna equipped with at least two dielectric substrates the above -- with the antenna for transmission and reception formed by the conductor pattern 53 on one dielectric substrate between two dielectric substrates 51 and 52 even if few the above -- with the antenna 50 for diversities formed by the conductor pattern 55 on one more dielectric substrate between two dielectric substrates 51 and 52 even if few It is formed in the end of the aforementioned antenna 50 for transmission and reception, and comes to contain the 1st electric supply terminal 57 for connecting with the transmitting-end circuit section and the receiving-end circuit section, and the 2nd electric supply terminal 59 for being formed in the end of the aforementioned antenna 50 for diversities, and connecting with the aforementioned receiving-end circuit section. Therefore, it has both not only a transceiver function but a diversity function.

[0011]

[Embodiments of the Invention] Hereafter, the gestalt of 1 operation of this invention is explained more to a detail based on an accompanying drawing. Here, the feature of this invention is to form the common antenna for transmission and reception and the common antenna for diversities in the structure which consists of a single dielectric substrate, or the structure with which the laminating of at least two or more dielectric substrates was carried out using the chip antenna manufacturing technology which forms a pattern by the conductive matter on a dielectric substrate. Therefore, since it has a diversity function, the complexity on the product design by equipping with the antenna of an exception can be canceled, and the miniaturization of a product which mounts an antenna can be attained by decreasing the size of the whole antenna.

[0012] Drawing 1 (A) shows the chip antenna 20 by the gestalt of 1 operation of this invention. The dielectric substrate 21 equipped with two conductor patterns 23 and 25 is shown in drawing 1 (A). On the aforementioned dielectric substrate 21, the 1st conductor pattern 23 for the common antenna for transmission and reception and the 2nd conductor pattern 25 for the antenna for diversities are formed. As for the aforementioned conductor patterns 23 and 25, it is desirable to consist of high conductivity metal matter, such as Ag, Cu, and Au, and to form in a meander line (meander line) type. Moreover, as for the aforementioned conductor patterns 23 and 25, it is desirable to the miniaturization of the whole chip antenna to form a predetermined angle change in the form of the pattern repeated twice [at least] or more.

[0013] On the other hand, the chip antenna 20 of this invention equips the end of the 1st conductor pattern 23 of the above with the 1st electric supply terminal 27 for connecting with a transmitter and a receiver, and equips the end of the 2nd conductor pattern 25 of the above with the 2nd electric supply terminal 29 for connecting only with a receiver. Especially the aforementioned 2nd electric supply terminal 29 is connected with a receiver (not shown), and the 2nd conductor pattern 29 of the above enables it to play a role of a diversity carrier trust antenna.

[0014] Next, with reference to drawing 1 (B), the operation of the aforementioned chip antenna in a radio terminal is explained. Drawing 1 (B) is the rough circuit diagram of the radio terminal equipped with the chip antenna concerning this invention.

[0015] The chip antenna concerning this invention consists of antennas which consist of two conductor patterns, as mentioned above. It is as follows when operation of the aforementioned circuit is explained briefly. As shown in the circuit diagram of drawing 1 (B), an antenna 20 is the dielectric substrate 21 in which the 1st conductor pattern 23 and the 2nd conductor pattern 25 were formed. The antenna formed by the 1st conductor pattern 23 transmits the electric wave

acquired from the transmitting end (Tx), and provides a receiving end (Rx) with the received electric wave. The antenna formed by the 2nd conductor pattern 25 provides a receiving end (Rx) with the received electric wave, and plays the role of the antenna for diversities. thus, the two aforementioned conductor patterns are formed on a single dielectric substrate, and each conductor pattern can function as the antenna for transmission and reception, and an antenna for diversities -- as -- the [the 1st and] -- the common antenna for transmission and reception and the antenna for diversities are simultaneously realizable by having 2 electric-supply terminal with a single chip antenna

[0016] Other features of this invention are for the diversity property by the attaching position of a common transceiver antenna and a diversity carrier trust antenna to be easily realizable. That is, the diversity property showed another diversity property by the attaching position of the antenna by the function, and since there is a problem that there is a possibility that the property itself may fall further, it has been made into the difficulty on the internal structure design of a terminal. However, by forming an antenna in a single chip gestalt by the conductor pattern, this invention was able to set up easily the attaching position for the property for which it asks, and was able to cancel the difficulty on the conventional design.

[0017] the [the 1st which constitutes the antenna for transmission and reception, and the antenna for diversities unlike the gestalt of the aforementioned implementation, and] -- 2 conductor patterns can also be formed in a dielectric substrate the green sheet of plurality [method / such] -- preparing -- among those, the sheet top of at least one sheet -- the / the 1st and / -- after forming 2 conductor patterns, it can also be made the method which carries out the laminating of this and calcinates it Also in the chip antenna which forms a conductor pattern in the aforementioned dielectric substrate, a desired diversity function can be easily obtained by constituting various conductor patterns like the gestalt of operation mentioned above. The method of manufacturing the antenna for transmission and reception and the antenna for diversities inside such a substrate will be clear to this contractor.

[0018] Next, the gestalt of various operations of the chip antenna for acquiring a desired diversity property is explained. With the gestalt of operation shown in drawing 1 (A) mentioned above, when keeping a predetermined interval and forming two conductor patterns, a space diversity effect can be obtained. The chip antenna concerning this invention other than the gestalt of operation shown in drawing 1 (A) can obtain a desired diversity function variously by transforming a conductor pattern.

[0019] Drawing 2 (A) and drawing 2 (B) are drawings showing the gestalt of operation of the chip antenna for having various diversity functions.

[0020] Drawing 2 (A) is such polarization. As shown in drawing 2 (A), a chip antenna is formed so that it may have the direction of polarization which is different in the 1st conductor pattern 33 and the 2nd conductor pattern 35. Therefore, the 2nd conductor pattern 35 which is an antenna for a diversity function can receive the electric wave received by the 1st conductor pattern 33 and the electric wave which intersects perpendicularly, and can perform a polarization diversity function.

[0021] Drawing 2 (B) is frequency. Such a chip antenna is the case where the method which differs in the resonance frequency of the antenna by each pattern is taken, by changing the length of the 1st conductor pattern 43 with the length of the 2nd conductor pattern 45. When drawing 2 (B) is referred to, it turns out that the 1st conductor pattern 43 is formed for a long time than the length of the 2nd conductor pattern 45. Therefore, the 2nd conductor pattern 45 has high resonance frequency, and can realize a frequency diversity function by the electric wave received through this.
 [0022] As mentioned above, this invention can obtain a desired diversity function by adjusting the mutual position of the conductor pattern formed on a dielectric substrate. Therefore, in the case of the radio terminal which adopts the aforementioned chip antenna, in order to take the attaching position of two antennas into consideration, the problem that an internal design must be considered beforehand is solvable.

[0023] The gestalt of the aforementioned implementation explains the method which forms a chip antenna using a single dielectric substrate. Although it is the multilayer type chip antenna (laminating chip antenna) which the gestalt of other operations of this invention carries out the

laminating of the two or more dielectric substrates unlike this, and is formed, it is realizable by the same principle as the gestalt of the aforementioned implementation.
[0024] Drawing 3 shows the multilayer type chip antenna 50 which consists of the 1st dielectric substrate 51 and the 2nd dielectric substrate 52. On the aforementioned 1st dielectric substrate 51 and the 2nd dielectric substrate 52, the 1st conductor pattern 53 and the 2nd conductor pattern 55 are formed, respectively. One edge each of the 1st conductor pattern 53 of the above and the 2nd conductor pattern 55 is equipped with the 1st electric supply terminal 57 and the 2nd electric supply terminal 59, respectively. The connection section with a transmitter and a receiver is offered, and the aforementioned 2nd electric supply terminal 59 offers the connection section with a receiver so that the 2nd conductor pattern 55 may function a diversity carrier trust antenna so that the aforementioned 1st electric supply terminal 57 may function the antenna for transmission and reception with the 1st common conductor pattern 53. It can have the function same as a result as the single dielectric substrate which also mentioned above the aforementioned multilayer type chip antenna.
[0025] this invention described above is limited by the claim rather than is limited by the gestalt and accompanying drawing of operation which were mentioned above. Therefore, the thing [in within the limits from which it does not separate from the technical thought of this invention of a publication in a claim] which changes [substitution, deformation, and] various gestalten will be clear to those who have the knowledge usual by this technical field.
[0026]
[Effect of the Invention] As mentioned above, according to the chip antenna of this invention, one chip antenna can perform not only a general transceiver function but a diversity function by forming the common antenna for transmission and reception, and the antenna for diversities in the structure which consists of a single dielectric substrate, or the structure with which the laminating of at least two or more dielectric substrates was carried out using the chip antenna manufacturing technology which forms a pattern by the conductive matter on a dielectric substrate. Therefore, the complexity on the product design by attachment of another antenna can be canceled, the product capacity by the antenna whole can be decreased, and the miniaturization of a product can be attained. And since various diversity properties can be easily acquired by adjusting the formation position of each conductor pattern, the problem on the conventional internal design is solvable.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The schematic diagram of the dual feed chip antenna according [(A)] to the gestalt of 1 operation of this invention and (B) are the circuit diagrams which adopted the dual feed chip antenna by this invention.
[Drawing 2] The schematic diagram of the dual feed chip antenna according [(A)] to the gestalt of other operations of this invention and (B) are the schematic diagrams of the dual feed chip antenna according to the gestalt of other operations further of this invention.
[Drawing 3] It is the schematic diagram of the multilayer type dual feed chip antenna by this invention.
[Drawing 4] The perspective diagram of the end machine of the non-end of line with which (A) was equipped with the conventional diversity reception function, and (B) are the circuit diagrams which realized the conventional diversity reception function.
[Description of Notations]
21 Dielectric Substrate
23, 33, 43, 53 The 1st conductor pattern
25, 35, 45, 55 The 2nd conductor pattern
27 57 The 1st electric supply terminal
29 59 The 2nd electric supply terminal
51 1st Dielectric Substrate
52 2nd Dielectric Substrate

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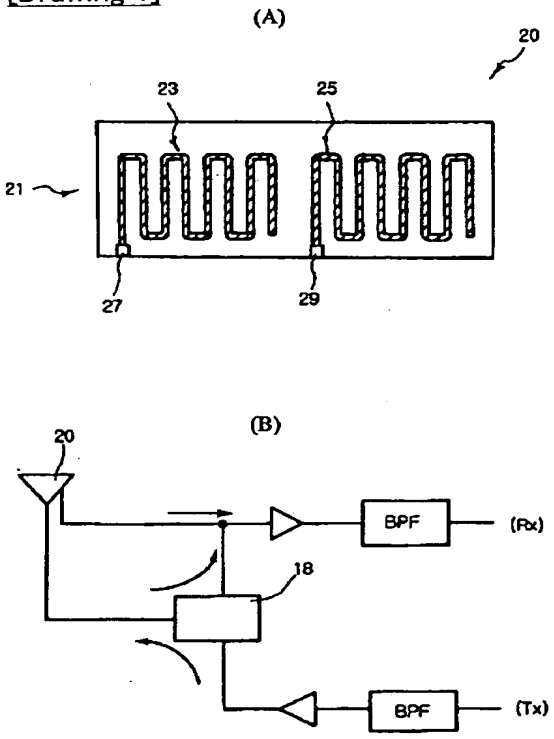
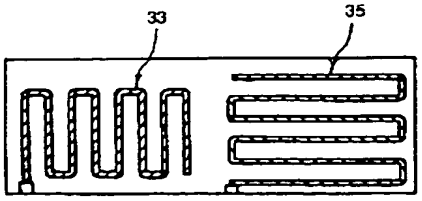
DRAWINGS

[Drawing 1]



[Drawing 2]

(A)



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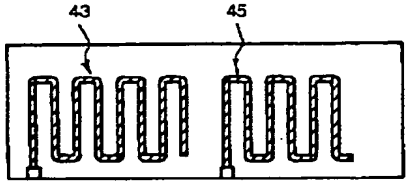
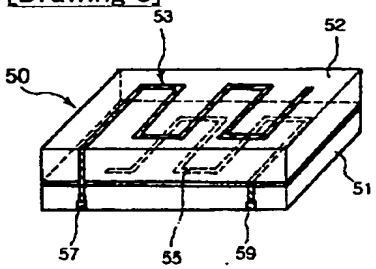
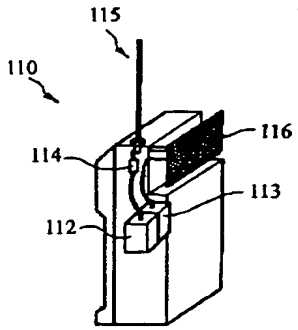


[Drawing 3]



[Drawing 4]

(A)



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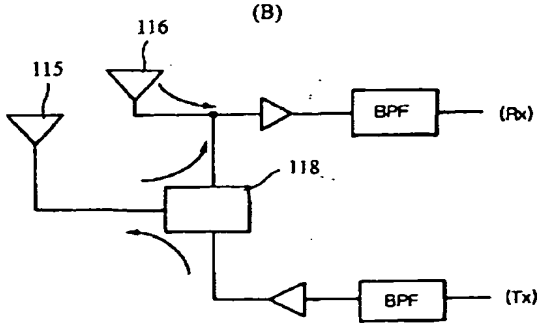

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